§12. Development of Imaging Monochromator in Normal Incidence Region (Ray Tracing and Preliminary Experiments)

Koog, J., Sato, K.

Spatially resolved measurement for impurity radiation is highly desirable to study impurity transport phenomena.

To get a monochromatic image of impurity radiation in VUV region, the ray tracing has been carried out and its image characteristics were simulated.

Off-Rowland mounting in near normal incidence with pinhole entrance slit, fixed exit slit and 2-dimensional detector system is found to be suitable to get a spatially resolved image (Fig.1.). Here, the rotation and linear motion of a grating are properly adjusted to satisfy the grating equation in the first order focusing[1].

In order to get the most suitable parameters between exit slit and detector system, the ray tracing was carried out to find the focusing position in the horizontal and vertical plane which is depend on the wavelength. Astigmatic image shapes and sizes which are depend on wavelength were simulated on exit slit position, sagittal focusing point and on proper distances behind exit slit(Fig.2.).

Preliminary experiments have been done by taking a monochromatic picture on the film which is placed at the detector position. As a light source Mercury lamp was used. Image lengths from fully illuminated grating on the film were in good agreements with ray-tracing results(Fig.3).

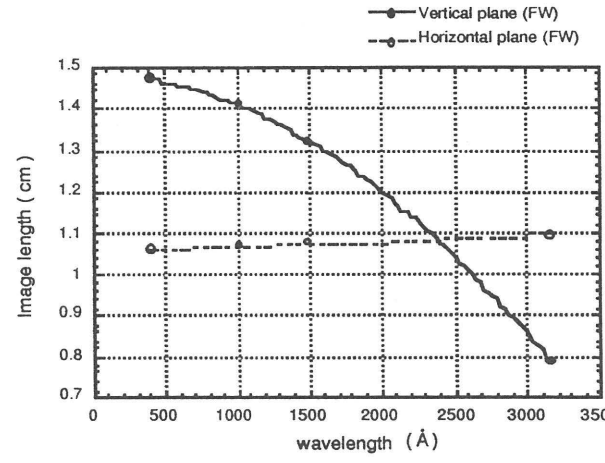

Fig.2. Image size in both directions 20 cm behind from exit slit

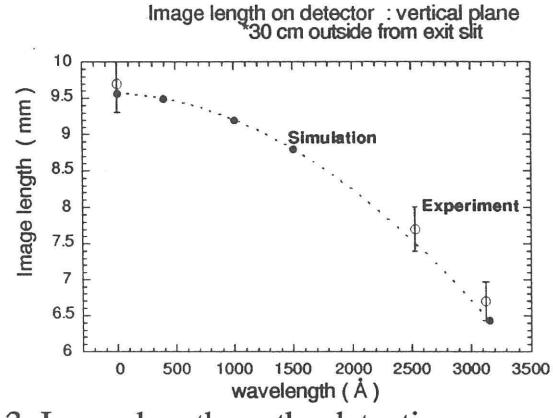

Fig.3. Image length on the detecting position as a funcuion of wavelength

Reference

1) Samson, J.A.R.,Techniques of VACUUM ULTRAVIOLET SPECTROSCOPY(John Wiley & Sons, Inc.1967)

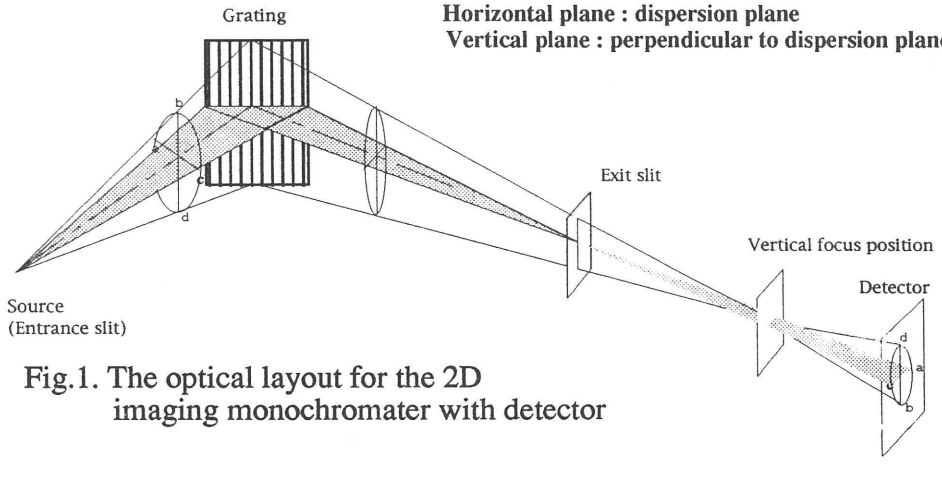

Fig.1. The optical layout for the 2D imaging monochromater with detector